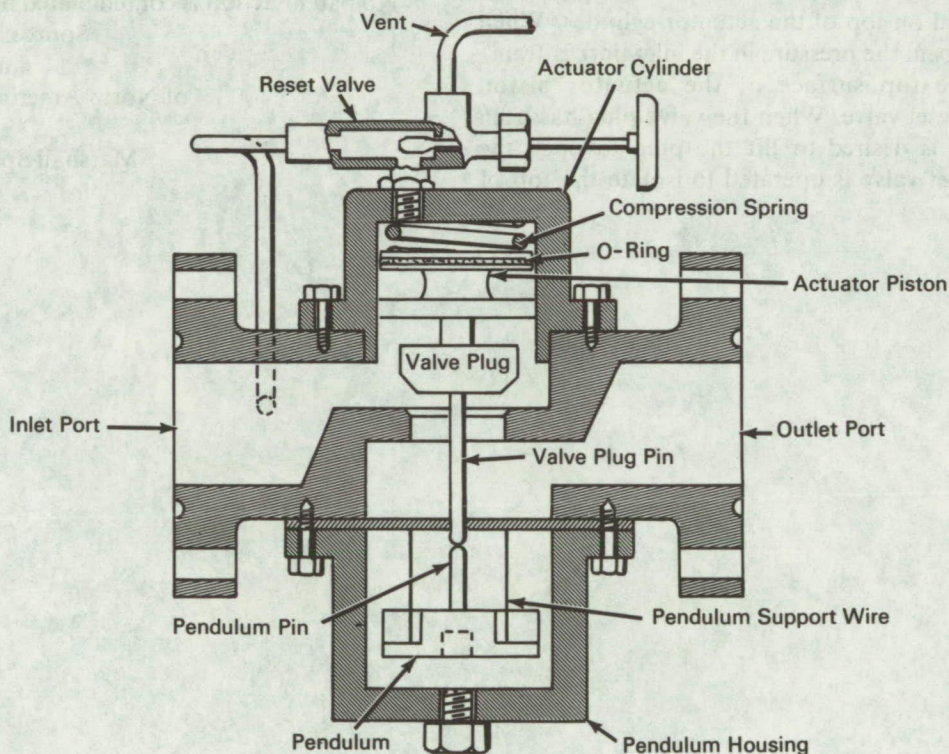


NASA TECH BRIEF



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Shock-Operated Valve Would Automatically Protect Fluid Systems



The problem:

To quickly shut down high-pressure fluid systems in the event of severe shock from explosion or earthquake.

The solution:

A glandless valve that uses a pendulum to support the valve closure plug in the open position. When the valve is jarred, the valve body is moved relative to the pendulum and the plug support is displaced, allowing the plug to seat and be held by spring pressure.

How it's done:

The valve body is composed of an actuator cylinder, a pendulum housing, and the main portion housing the fluid inlet and outlet ports. The pendulum housing, mounted below the inlet-outlet ports, is directly opposite the actuator cylinder which is mounted above the ports.

An actuator piston with rubber O-ring is mounted within the actuator cylinder and a compression spring is installed between the piston and the cylinder head.

(continued overleaf)

A valve plug is attached to the bottom of the cylinder with a steel pin extending downward from the bottom of the plug, through the valve seat, and into the pendulum housing.

This pin contacts a second pin that extends upward from the top of a pendulum weight suspended within the pendulum housing by three identical wires. When these pins meet longitudinally, the spring above the actuator piston is held in the compressed position and the valve plug is held above its seat.

When the valve is severely jarred the valve body moves relative to the pendulum. When this relative movement occurs, the pins no longer contact along their centerlines and thus cannot support the force from the spring. The spring then forces the valve plug down into its seat to secure the system.

The valve may be reset by the operation of a reset valve mounted on top of the actuator cylinder. When the valve is open, the pressure in the inlet port is transmitted to the top surface of the actuator piston through the reset valve. When the valve plug has been seated and it is desired to lift the plug to open the valve, the reset valve is operated to isolate the top of

the actuator cylinder from the inlet pressure and vent it to the atmosphere. The high inlet pressure still acting on the bottom of the piston forces it up against the spring, lifting the plug off the seat and allowing the pins to contact again longitudinally. The reset valve is then set to transmit inlet pressure once again to the top of the actuator cylinder for normal open operation.

Notes:

1. The valve features a closure time equal to the pendulum period.
2. This development is in conceptual stage only, and as of date of publication of this Tech Brief, neither a model nor prototype has been constructed.

Patent status:

No patent action is contemplated by NASA.

Source: Gerald H. Wells
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